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Report of the individual review of the annual submission of Portugal submitted in 2013*

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

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I. Introduction and summary

1. This report covers the review of the 2013 annual submission of Portugal, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 16 to 21 September 2013 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Mr. Leif Hockstad (United States of America) and Mr. Marius Tăranu (Republic of Moldova); energy – Ms. Rayna Angelova (Bulgaria), Ms. Duduzile Nhlengethwa-Masina (Swaziland), Mr. Norbert Nziramasanga (Zimbabwe) and Ms. Songli Zhu (China); industrial processes and solvent and other product use – Mr. Joseph Baffoe (Ghana), Ms. Valentina Idrisova (Kazakhstan) and Mr. Takuji Terakawa (Japan); agriculture – Ms. Olga Gavrilova (Estonia) and Ms. Janka Szemesova (Slovakia); land use, land-use change and forestry (LULUCF) – Mr. Emil Cienciala (Czech Republic) and Mr. Mark McGovern (Canada); and waste – Ms. Detelina Petrova (Bulgaria) and Ms. Irina Yesserkepova (Kazakhstan). Mr. Hockstad and Mr. Tăranu were the lead reviewers. The review was coordinated by Mr. Stylianos Pesmajoglou (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of Portugal, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2012 annual review report of Portugal was published after the submission of the 2013 annual submission.

3. In 2011, the main greenhouse gas (GHG) in Portugal was carbon dioxide (CO_2), accounting for 73.6 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by methane (CH_4) (17.8 per cent) and nitrous oxide (N_2O) (6.4 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 2.2 per cent of the overall GHG emissions in the country. The energy sector accounted for 69.5 per cent of total GHG emissions, followed by the waste sector (11.8 per cent), the agriculture sector (10.7 per cent), the industrial processes sector (7.6 per cent) and the solvent and other product use sector (0.4 per cent). Total GHG emissions amounted to 69,986.45 Gg CO_2 eq and increased by 14.7 per cent between the base year[2] and 2011. The ERT concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol, by gas and by sector and activity, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector, and also do not include the emissions from deforestation that were included in Portugal's initial report under the Kyoto Protocol for the base year and subsequently used for the calculation of the assigned amount.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from sources included in Annex A to the Kyoto Protocol only.

5. Additional background data on recalculations by Portugal in the 2013 annual submission, as well as information to be included in the compilation and accounting database, can be found in annex I to this report.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year[a] to 2011

			Gg CO_2 eq								Change (%)
		Greenhouse gas	Base year[a]	1990	1995	2000	2008	2009	2010	2011	Base year–2011
Annex A sources		CO_2	45 149.36	45 149.36	54 485.70	65 863.22	59 984.44	57 049.85	52 640.56	51 526.54	14.12
		CH_4	10 260.49	10 260.49	11 372.17	12 113.03	12 189.53	12 027.54	12 484.31	12 446.61	21.31
		N_2O	5 542.54	5 542.54	5 673.08	5 998.24	5 023.48	4 718.55	4 698.95	4 478.92	–19.19
		HFCs	66.27	NA, NE, NO	66.27	319.04	1 248.56	1 378.86	1 515.03	1 491.49	2 150.72
		PFCs	NA, NO	NA, NE, NO	NA, NO	0.03	0.04	0.00	0.00	0.00	NA
		SF_6	6.83	NA, NE, NO	6.83	9.70	35.63	40.89	43.57	42.89	528.19
KP-LULUCF	Article 3.3[b]	CO_2					–1 261.71	–1 382.20	–1 232.92	–1 591.26	
		CH_4					15.69	85.40	136.29	93.12	
		N_2O					205.14	633.07	857.06	590.09	
	Article 3.4[c]	CO_2	6 779.53				–842.86	–1 248.94	882.49	–842.53	NA
		CH_4	6.90				15.18	70.69	174.08	75.89	NA
		N_2O	506.47				174.91	281.66	410.73	363.00	NA

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NE = not estimated, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2011

			Gg CO_2eq							Change (%)
	Sector	Base year[a]	1990	1995	2000	2008	2009	2010	2011	Base year-2011
Annex A	Energy	41 634.94	41 634.94	50 766.38	61 245.85	55 563.27	54 324.47	49 667.35	48 610.50	16.8
	Industrial processes	4 906.79	4 833.70	5 281.95	6 494.44	7 390.58	5 767.05	6 064.82	5 323.95	8.5
	Solvent and other product use	329.62	329.62	310.08	297.78	263.85	269.93	225.76	266.69	- 19.1
	Agriculture	8 159.50	8 159.50	8 180.97	8 693.36	7 617.09	7 513.15	7 517.39	7 504.88	–8.0
	Waste	5 994.63	5 994.63	7 064.67	7 571.83	7 646.89	7 341.10	7 907.10	8 280.43	38.1
	LULUCF	NA	8 496.18	4 203.92	2 260.84	–6 260.98	–6 226.57	–3 485.26	–5 319.75	NA
	Total (with LULUCF)	**NA**	**69 448.57**	**75 807.97**	**86 564.11**	**72 220.71**	**68 989.13**	**67 897.16**	**64 666.69**	**NA**
	Total (without LULUCF)	**61 025.48**	**60 952.39**	**71 604.05**	**84 303.27**	**78 481.69**	**75 215.70**	**71 382.42**	**69 986.45**	**14.7**
	Other[b]									
KP-LULUCF	Article 3.3[c] Afforestation and reforestation					–6 765.22	–6 954.67	–6 756.31	–7 102.34	
	Article 3.3[c] Deforestation					5 724.34	6 290.93	6 516.75	6 194.30	
	Total (3.3)					**–1 040.88**	**–663.74**	**–239.56**	**–908.04**	
	Article 3.4[d] Forest management					–1 937.16	–1 892.74	780.30	–647.80	
	Article 3.4[d] Cropland management	5 257.94				1 510.44	1 340.58	1 157.72	908.83	–82.7
	Article 3.4[d] Grazing land management	2 034.66				–226.06	–344.42	–470.73	–664.67	–132.7
	Article 3.4[d] Revegetation	NA				NA	NA	NA	NA	NA
	Total (3.4)	**NA**				**–652.78**	**–896.58**	**1 467.30**	**–403.64**	**NA**

Abbreviations: KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] "Base year" for sources included in Annex A to the Kyoto Protocol refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The "base year" for cropland management, grazing land management and revegetation under Article 3, paragraph 4, of the Kyoto Protocol is 1990. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2013 annual inventory submission was submitted on 15 April 2013 and resubmitted on 24 May 2013; it contains a complete set of common reporting format (CRF) tables for the period 1990–2011 and an NIR. Portugal also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2013. The annual submission was submitted in accordance with decision 15/CMP.1.

7. The full list of materials used during the review is provided in annex II to this report.

2. Overall assessment of the inventory

8. Table 3 contains the ERT's overall assessment of the annual submission of Portugal. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

		General findings and recommendations
The ERT's findings on completeness of the 2013 annual submission		
Annex A sources[a]	Complete	Mandatory: none
		Non-mandatory: "NE" is reported for: agricultural soils – CH_4
Land use, land-use change[a] and forestry	Complete	Mandatory: none
		Non-mandatory: none
KP-LULUCF	Complete	
The ERT's findings on recalculations and time-series consistency in the 2013 annual submission	Generally consistent	The recalculations chapter of the NIR addresses recalculations due to previous review recommendations, but the ERT recommends that the Party improve the description of the recalculations in the NIR, by including more detailed descriptions of the changes that have occurred in the NIR (see specific recommendations in paras. 49, 60, 78, 83, 85)
The ERT's findings on verification and quality assurance/quality control procedures in the 2013 annual	Not sufficient	The NIR provides limited information on the QA/QC procedures implemented. The ERT recommends that Portugal increase its QA/QC

		General findings and recommendations
submission		and verification procedures for sectoral reporting, namely for the purpose of more consistent reporting in the NIR and in the CRF tables (see specific recommendations in paras. 9, 16, 20, 22, 31, 32, 39, 44, 51, 54, 64, 67(f), 69, 76, 80)
The ERT's findings on the transparency of the 2013 annual submission	Not transparent	The ERT made specific recommendations in the sectoral parts of this report, specifically in paragraphs 9, 15, 19, 22, 23, 27, 29, 35, 36, 38, 40–44, 46, 47, 49, 52–53, 56, 57, 59, 61–63, 68, 70, 72, 78, 79, 81, 84, 89, 90

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NE = not estimated, NIR = national inventory report, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

9. The NIR and additional information provided by the Party during the review described the national system for the preparation of the inventory. The Portuguese Environmental Agency (APA) is the national entity responsible for the overall coordination for the national inventory. Other organizations are also involved in the preparation of the inventory. Portugal provides some details in the NIR on its quality assurance/quality control (QA/QC) procedures and archiving system, but more information could be provided. In response to questions raised by the ERT during the review, Portugal provided its three-year schedule for QA/QC activities and more details of specific QA/QC coordination activities. The ERT recommends that Portugal include these details in the NIR to further clarify its capacities on elaborating a QA/QC plan in line with the specific functions contained in decision 15/CMP1, paragraph 12(d). Also, in response to questions by the ERT, Portugal provided its "methodological development plan", which is developed by APA in cooperation with the sectoral focal points to institute planned improvements and responses to review recommendations. The ERT encourages Portugal to describe, more specifically, the methodological development plan in the NIR, highlighting its prioritization schedule and sectoral improvement plans. The ERT also recommends that, as part of its inventory planning, Portugal update its NIR by including the references used, and by documenting clearly the justifications for country-specific methodological approaches.

Inventory preparation

10. Table 4 contains the ERT's assessment of Portugal's inventory preparation process.

Table 4
Assessment of inventory preparation by Portugal

		General findings and recommendations
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF)?	Yes	
Approach followed?	Both tier 1 and tier 2	
Were additional key categories identified using a qualitative approach?	No	
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto Protocol and the associated key categories in the UNFCCC inventory?	Yes	
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	
Are there any changes to the key category analysis in the latest submission?	No	
Assessment of uncertainty analysis		
Approach followed?	Tier 1	
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	The ERT recommends that the Party improve the reporting of the uncertainty analysis results in the NIR, including quantitative results for the uncertainty in total GHG emissions, both level and trend in the NIR (see also paras. 53 and 70 below)
Quantitative uncertainty (including LULUCF)	Level = 13.01% Trend = 12.30%	
Quantitative uncertainty	Level = 9.95%	

	General findings and recommendations
(excluding LULUCF)	Trend = 9.55%

Abbreviations: ERT = expert review team, GHG = greenhouse gas, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

Inventory management

11. Portugal has a centralized archiving system, which includes the archiving of disaggregated emission factors (EFs) and activity data (AD), and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. APA is responsible for the centralized archiving system. During the review, the ERT was provided with the requested additional archived information. The ERT reiterates the recommendation made in the previous review report that Portugal improve its archiving system by providing further guidance on the record-keeping and archiving procedures.

4. Follow-up to previous reviews

12. In response to questions raised during the review week, Portugal stated that some of the recommendations in the previous review report had been implemented, while others were not implemented owing to delays in the publication of the previous review report. Portugal also provided its methodological development plan, which included prioritizations and steps to implement recommendations from the previous review report. These recommendations include further incorporation of plant-specific data in the energy and industrial processes sectors, use of improved digestibility values for enteric fermentation calculations in the agriculture sector, and demonstration that the carbon pools reported as not occurring are not net sources for LULUCF. The ERT is of the view that the implementation of recommendations from previous reviews is necessary in order to improve the quality of the Party's inventory and to demonstrate that the functions of the national system are fully operative. The ERT therefore strongly recommends that Portugal implement all of the recommendations from the previous review report as a matter of priority.

5. Areas for further improvement identified by the expert review team

13. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 8.

B. Energy

1. Sector overview

14. The energy sector is the main sector in the GHG inventory of Portugal. In 2011, emissions from the energy sector amounted to 48,610.50 Gg CO_2 eq, or 69.5 per cent of total GHG emissions. Since 1990, emissions have increased by 16.8 per cent. The key driver for this rise was transport activities, which increased by 70.2 per cent since 1990. Within the sector, 36.1 per cent of the emissions were from transport, followed by 34.0 per cent from energy industries, 17.7 per cent from manufacturing industries and construction and 9.7 per cent from other sectors. Fugitive emissions from oil and natural gas accounted

for 2.4 per cent and other (energy) accounted for 0.2 per cent. Fugitive emissions from solid fuels are reported as included elsewhere ("IE") or not occurring ("NO").

15. The ERT commends Portugal for its efforts to improve transparency but notes that some methodologies are still not adequately explained in the NIR including, for example, how the flaring feed density is taken into account in the calculation of emissions. The ERT recommends that the Party improve transparency in this regard.

16. The ERT noted a number of errors and omissions in the NIR, specifically: outdated EFs (see para. 31 below); outdated AD for the consumption of other fuels in the NIR (page 3–43, table 3.19 (other)), which is 14 per cent lower than the value in the CRF tables; inconsistency in the number of operational large point source energy plants in the NIR (on page 3–9 it is indicated that 19 such plants are in operation, while table 3.1 shows 20); and the second chemical equation in the NIR, page 3–13 is incorrect. Portugal also accidentally reported emissions for oil transportation as oil transformation (CRF table 1.B.2). The ERT recommends that Portugal improve its QA/QC procedures to ensure consistency in its reporting.

2. Reference and sectoral approaches

17. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraphs 18–25 below.

Table 5
Review of reference and sectoral approaches

		Paragraph cross-references
Difference between the reference approach and the sectoral approach	Energy consumption: –9.72 PJ, –1.49% CO_2 emissions: –404.86 Gg CO_2 eq, –0.87%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	No	18
Are differences with international statistics adequately explained?	No	19 and 20
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	21
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	No	22–25

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

18. The ERT noted that, for the reference approach, Portugal reported data only for other bituminous coal and for coal briquettes/patent fuel; for all other coal types, the notation key "NO" was used. In response to a question raised by the ERT, the Party explained that the two reported coal types also include data for coke oven/gas coke, coking coal and sub-bituminous coal. In the light of this information, the ERT noted that there is an underestimation of CO_2 emissions from the reference approach due to differences in default carbon factor values for different coal types (29.5 t carbon (C)/TJ for coke oven/gas coke compared with 27.0 t C/TJ for coal briquettes/patent fuel; 26.2 t C/TJ for sub-bituminous coal and 25.8 t C/TJ for coking coal compared with 25.1 t C/TJ for coking coal). The ERT recommends that the Party report separately for each coal type using different EFs.

19. The ERT noted that there are differences in the apparent fuel consumption data reported in the CRF tables and in the International Energy Agency (IEA) statistics. For 1990, data in the CRF tables were 8 per cent higher than IEA data, while in 2011 data in the CRF tables were 4 per cent lower. In response to a question raised by the ERT, the Party explained that these differences were due to discrepancies regarding imports and consumption of crude oil, differences in the aggregation of AD for solid fuels, and naphtha exports appearing in IEA data but not in national statistics. The ERT took note of these explanations and recommends Portugal to reconcile or provide clear explanations for the differences between the two data sets.

20. The ERT noted that natural gas imports for 2003 (CRF table 1.A(b)) were 10 per cent higher than IEA data. In response to a question raised by the ERT, Portugal explained that the value in the CRF table was not correct and that the actual value should be 2,655,896 tonnes of oil equivalent. The ERT took note of this explanation and recommends that Portugal make this correction in the CRF table and in its NIR.

International bunker fuels

21. No issues were identified.

Feedstocks and non-energy use of fuels

22. The ERT noted that, for 2011 Portugal did not estimate some CO_2 emissions associated with non-energy use of fuels (CRF table 1.A(d)) or CO_2 stored in products for some fuels (coal oils and tars (from coking coal), natural gas, gas/diesel oil, and ethane). Portugal did not fully explain in the NIR how these emissions are treated, only noting that emissions from mineral oil use as lubricants and emissions from wear of bitumen in roads were not estimated. In response to a question raised by the ERT, the Party explained that this will be corrected in its next annual submission. The ERT strongly recommends that the Party make this correction in order to improve completeness and transparency. The ERT recommends that Portugal estimate the non-energy use of their fuels in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance), ensuring that there is no double counting or underestimation of emissions.

23. The ERT noted that in 2009 there was a sudden, large drop in non-energy use of other fuels of 99 per cent from 2008 levels. In response to a question raised by the ERT, Portugal clarified that this occurred as a result of the cessation of the production of ammonia, which is explained in the executive summary of the NIR and in the industrial processes chapter of the same report. In order to improve transparency and consistency, the

ERT recommends that Portugal cross-reference this information in the energy chapter of its NIR.

24. During the previous review, the ERT had asked the Party whether the residual fuel used for the production of ammonia had been deducted from the energy sector to avoid double counting. During the current review, the ERT enquired on this again and Portugal explained that the non-energy use of fuels is under revision and this would be addressed in the next annual submission.

25. The ERT noted that in CRF table 1.A(d) where the AD were reported as "NO", the implied emission factors (IEFs) and emissions were reported as "NE" (not estimated). In response to a question raised by the ERT, Portugal mentioned that in its next annual submission the notation key "NO" will be used consistently. The ERT recommends that the Party implement this correction.

3. Key categories

Stationary combustion: all fuels – CO_2, CH_4 and N_2O

26. The ERT noted that Portugal continues to report CO_2 emissions from limestone used for desulphurization under fuel combustion despite the recommendation by the previous ERT that Portugal report these emissions under the industrial processes sector. In response to a question raised by the ERT, the Party explained that this was due to the fact that the previous review report was not received in time to implement the recommendation. The ERT reiterates the recommendation that the Party report these emissions in the industrial processes sector in order to improve comparability across Parties.

27. The ERT also noted that the CH_4 IEF for solid fuels in manufacturing industries and construction has decreased since 1990 (7.31 kg/TJ) to a value of 3.88 kg/TJ in 2011. This represents a reduction of 46.9 per cent, which is much larger than the 11.4 per cent reduction in CO_2 IEF resulting from the incorporation of emissions from cullet. The ERT strongly recommends that Portugal explains this in its NIR.

28. Based on findings from the previous review, Portugal estimated emissions from refineries related to fuels that were previously not considered, such as the consumption of natural gas in refineries to produce hydrogen. This resulted in recalculations for the time series. The ERT commends Portugal for this improvement.

29. The ERT noted that the CH_4 IEF for emissions resulting from the consumption of gaseous fuels in energy industries has increased from 0.26 kg/TJ in 1997 to 0.83 kg/TJ in 2011. In response to questions raised by the ERT, Portugal explained that, in addition to the introduction of natural gas from 1998 onwards, more power plants have been reporting emissions using a higher EF for natural gas (1.4 g/GJ instead of 0.1g/GJ). Both EFs are from European Monitoring and Evaluation Programme (EMEP)/ Co-ordinated Information on the Environment in the European Community (CORINAIR) (3rd edition, table 27) and are for different methodologies of natural gas consumption. The ERT recommends that Portugal improve the transparency of its reporting by including this information in its NIR.

30. During the previous review, Portugal had expressed its intention to revise the methodology used to estimate emissions for iron and steel production resulting from the consumption of oil waste and tar. In response to a question raised by the ERT, Portugal explained that it revised the AD collection method by obtaining consumption data directly from facilities, comparing this information with data from the energy balance and, where there were differences, using the highest of the two. In the light of this information, the ERT noted the potential for the overestimation of emissions and recommends that Portugal reconcile the differences between the two data sets.

31. During the previous review, the ERT had noted that Portugal had used different CO_2 EFs for gasoline in the subcategory manufacturing industries and construction (68.6 kg CO_2/GJ) compared with the transport subcategory (73.0 kg CO_2/GJ). Although revised estimates were provided in the 2013 annual submission, Portugal has continued to report in the NIR the use of different EFs, even within the manufacturing industries and construction (68.6 and 69.3 kg CO_2/GJ). In response to a question raised by the ERT during the current review, the Party explained that although the same EF is being used (73.00 kg CO_2/GJ) throughout, the NIR was not fully updated to reflect this change. The ERT recommends that the Party further improve consistency and transparency by appropriately updating the NIR.

32. The ERT also noted a small difference in the CO_2 EFs for diesel oil that are being used for manufacturing industries and construction (74.1 kg CO_2/GJ), and for transport activities (74.0 kg CO_2/GJ). In response to a question raised by the ERT, Portugal explained that this difference was the result of rounding of the EFs and assured the ERT that they would report correctly in the next annual submission.

Road transportation: liquid and gaseous fuels – CO_2, CH_4 and N_2O

33. In response to a recommendation in the previous review report, Portugal updated the CO_2 EF for the use of natural gas in road transportation from 64.1 t CO_2/TJ to 63.0 t CO_2/TJ. The latter value is comparable with the IPCC default value whereas the former was leading to an overestimation of emissions. The ERT commends Portugal for this improvement.

Railways: liquid fuels – CO_2

34. The previous review report recommended that Portugal use the same CO_2 EF for the same type of diesel oil in order to ensure consistency. In the current submission (NIR page 3-188, table 3.102), Portugal reported the use of a CO_2 EF (an average of EMEP/CORINAIR, IPCC and the European Union (EU) Methodologies for Estimating Air Pollutant Emissions from Transport (MEET) project) of 3,168 kg/tonne, which translates to 75.67 kg CO_2/GJ compared with 74.1 kg CO_2/GJ and 74.0 kg CO_2/GJ used for other transport subcategories. In response to questions raised by the ERT during the current review, Portugal explained that it has updated the diesel oil EF value in its 2014 annual submission and used for railways the same EF that is used for other transport subcategories (74.1 kg CO_2/GJ) for the entire time series.

Fugitive emissions from oil and natural gas: all – CO_2, CH_4

35. The ERT noted that Portugal reported emissions from flaring together with venting emissions (CRF table 1.B.2). In the NIR (page 3-194), the Party provides no information on intentional venting but explains that during flaring some partly unburned compounds are emitted when the gas influx exceeds the flare combustion capacity. In response to a question raised by the ERT, Portugal expressed its intention to disaggregate flaring and venting emissions in future annual submissions. The ERT recommends the Party to undertake this disaggregation and clearly explain how this was done in its NIR.

36. The ERT noted that Portugal reported emissions from hydrogen production and fluid catalytic conversion as emissions due to the refining and storage of oil, without providing any explanation on this in the NIR. The ERT recommends that Portugal introduce this information in the NIR.

C. Industrial processes and solvent and other product use

1. Sector overview

37. In 2011, emissions from the industrial processes sector amounted to 5,323.95 Gg CO_2 eq, or 7.6 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 266.69 Gg CO_2 eq, or 0.4 per cent of total GHG emissions. Since the base year, emissions have increased by 8.5 per cent in the industrial processes sector, and decreased by 19.1 per cent in the solvent and other product use sector. The key drivers for the rise in emissions in the industrial processes sector are increases from emissions mineral products (specifically from cement, lime and glass production), from the consumption of halocarbons and SF_6 (specifically from refrigeration and air-conditioning equipment, foam blowing and fire extinguishers) and from the chemical industry (specifically nitric acid production). Within the industrial processes sector, 66.1 per cent of the emissions were from mineral products, followed by 28.8 per cent from consumption of halocarbons and SF_6, 3.5 per cent from chemical industry and 1.6 per cent from metal production. Other production accounted for less than 0.1 per cent.

38. Portugal has generally improved the accuracy of its emission estimates for the industrial processes and solvent and other product use sectors by developing higher-tier methods and collecting AD directly from the plants. However, some of these improvements have not been adequately explained in the NIR, such as for lime production and glass production. The ERT recommends that Portugal improve the transparency of the NIR by providing a more detailed description of the improvements made.

39. Information on the implemented sector-specific QA/QC has been provided by Portugal and the ERT appreciates the efforts made by the Party to improve the quality of the data. However, the ERT identified inconsistencies in the information provided in the NIR and the CRF tables during the review, such as for glass production. The ERT recommends that the Party enhance the QA/QC procedures for the industrial processes sector in order to enhance the consistency of the information provided.

2. Key categories

Cement production – CO_2

40. As identified in the previous review report, the ERT noted that for the period 2005–2011 Portugal used a tier 3 methodology based on the European Union Emissions Trading System (EU ETS) (annex VII to decision 2007/589/EC) to estimate CO_2 emissions based on the carbonate content of the raw materials used. However, it also noted that the NIR does not provide sufficient information on how the emissions were estimated for the previous years. In response to a question raised by the ERT, the Party explained that emissions from cement production for the period 1990–2004 were based on AD that were derived from a simple back-casting methodology using the clinker production time series provided directly by the cement production plants. The ERT reiterates the recommendation in the previous review report that the Party provide a detailed description of the methodology to ensure transparency in the use of this approach in its NIR and further describe how time-series consistency is ensured.

Lime production – CO_2

41. The ERT noted that Portugal used a methodology based on the EU ETS (annex VIII to decision 2007/589/EC) to estimate CO_2 emissions from lime production for the period 2005–2011. It also noted that, for different time periods, the emission estimates were calculated using different sources of AD. In response to a question raised by the ERT, the Party informed the ERT about its intention to check all AD on lime production and to include information of the results of this check in its next annual submission. The ERT

welcomes the planned efforts by Portugal to improve the accuracy and time-series consistency of its emission estimates. The ERT reiterates a recommendation from the previous review report that the Party provide the results of the AD check for lime production in its NIR.

Ammonia production – CO_2

42. The ERT noted that the emissions from this subcategory were based on the total production of ammonia from the only existing facility for the period 1990–2008. The plant has since been relocated to India. The ERT also noted that for the period 1990–1994 the methodology takes into account the consumption of residual fuel as feedstock (based on the database of the Portuguese Statistical Office (INE)). However the AD, and hence the emissions, for the period 1992–1994 are low compared with other years. In response to a question raised by the ERT, Portugal explained that because of data availability issues for the period up to 1994, the AD were derived from a linear correlation based on the amount of ammonia produced. The ERT encourages Portugal to include this explanation in its NIR to ensure transparency.

Consumption of halocarbons and SF_6 – HFCs

43. The ERT noted that Portugal used two models to estimate the potential and actual HFC emissions, which are based on many assumptions and on expert judgement or default values from the IPCC good practice guidance or the *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines). The ERT noted that although the Party informed the ERT that it has compared the results of the models, thereby allowing the verification of the assumptions and results, the comparisons on the use of the models has not been clearly explained in the NIR. The ERT appreciates the efforts made by Portugal to improve the quality of the emissions data, and recommends that the Party increase the transparency of its reporting by providing information on the comparison of the results of the two models in its NIR, including how the use of the 2006 IPCC Guidelines is consistent with the IPCC good practice guidance and the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines).

3. Non-key categories

Glass production – CO_2

44. In response to a recommendation made in the previous review report, Portugal has used a new methodology that is based on the carbonate raw material used. However, the NIR does not provide information on the new methodology; instead it explains the previously used methodology that was based on glass production data. In response to a question raised by the ERT, the Party clarified that from 2005 onwards it used EU ETS data on sodium carbonate, magnesium carbonate, calcium carbonate, barium carbonate, coal and other carbonate raw materials consumption in the kilns. It also explained that it used stoichiometric CO_2 EFs for each carbonate (based on annex IX of directive 2003/87/EC) to estimate emissions for the period 1990–2004 since there were no detailed data on carbonate raw material consumption from the EU ETS for that period. The ERT welcomes the efforts made by Portugal and recommends that the Party include the additional explanations provided during the reviews in its NIR in order to improve transparency and to further explain how time-series consistency is maintained by its approach.

Limestone and dolomite use – CO_2

45. The ERT noted that Portugal accounts for CO_2 emissions resulting from production of calcium and magnesium nitrates and consumption of sodium carbonates in paper pulp

production under this subcategory. It also noted that CO_2 emissions from the use of carbonate materials in glass industry were included under glass production (other mineral products). In addition, the CO_2 emissions from the use of carbonates as flux in blast furnaces in the subcategory iron and steel industry have been included under the energy sector (manufacturing industries and construction) based on the assumption that the EF of CO_2 from blast furnace consumption already includes the carbon from limestone that was released from the flux in the blast furnace. In the previous review report, the ERT had encouraged Portugal to reallocate these emissions from the energy to the industrial processes sector in line with the UNFCCC reporting guidelines. The ERT reiterates this encouragement.

Consumption of halocarbons and SF_6 – SF_6

46. The ERT noted that SF_6 is used in electrical equipment both as an insulation gas in substations, and as current interruption media (mostly in switchgear and in circuit breakers). The AD for the estimation of emissions from this subcategory are based on expert judgment and the NIR does not provide sufficient information on the approach used to differentiate between electrical equipment use and electrical equipment manufacture. In response to a question raised by the ERT, Portugal stated that it uses EFs from the 2006 IPCC Guidelines (tables 8.2 and 8.3) and confirmed that several assumptions were based on expert judgement. It also confirmed that the methodology described in the NIR (chapter 4.3.5.15) does not take into account the amount of SF_6 imported or exported in products. The ERT recommends that the Party provide in its NIR more complete information on the methodology used to improve transparency.

Solvent and other product use – CO_2

47. The ERT noted that Portugal used the notation key "NE" for reporting AD under paint application, degreasing and dry cleaning, and chemical products and processing even though CO_2 and N_2O emissions were reported for these activities. In response to a question raised by the ERT, the Party explained that the use of the notation key "NE" was because of the different units taken into account in the estimation of emissions (e.g. for paint application: construction and buildings, the AD unit was tonnes of paint; while for paint application: manufacture of automobiles, the AD unit was the number of vehicles). The ERT took note of this explanation and recommends that Portugal provide clear explanations of the data and methodology used in its NIR.

D. Agriculture

1. Sector overview

48. In 2011, emissions from the agriculture sector amounted to 7,504.88 Gg CO_2 eq, or 10.7 per cent of total GHG emissions. Since 1990, emissions have decreased by 8.0 per cent. The key driver for the fall in emissions is the reduction of animal numbers (dairy cattle were reduced from about 394,000 heads in 1990 to about 247,000 heads in 2011 and sheep were reduced by about 1 million heads during the same time period). There was also a significant decrease in N_2O emissions from agricultural soils as a result of a reduction in using of synthetic fertilizers (more than 25 per cent fall). Within the sector, 38.5 per cent of the emissions were from agricultural soils, followed by 37.1 per cent from enteric fermentation, 17.9 per cent from manure management and 6.1 per cent from rice cultivation. The remaining 0.5 per cent was from field burning of agricultural residues. Prescribed burning of savannas does not occur in Portugal and emissions are reported as "NO".

49. The ERT welcome the progress made by Portugal in increasing its transparency in the reporting of recalculations. The Party provided a list of recalculations at the beginning of the agriculture chapter of the NIR and short paragraphs after each subchapter. However, the NIR does not describe the impact of the recalculations on the total GHG emissions and lack of this information may cause misunderstandings. Therefore, the ERT recommends that Portugal increase the transparency of the reporting of recalculations by including more comprehensive information on the reasons for the recalculations, the impact on GHG emissions and a comparison of previous and actual estimations for each category.

50. Since the previous annual submission, Portugal has made only minor improvements and very few of the recommendations in the previous review report were implemented (e.g. reallocation of the CH_4 recovery from waste to agriculture sector). The planned improvements identified by the Party in the previous NIR were not implemented and were listed again in the current submission. Therefore the ERT encourages Portugal to make more effort to implement both the planned improvements and the recommendations in the previous review report in order to improve the quality of the emissions data from agriculture.

51. Although Portugal identified key categories in the agricultural sector using the tier 2 approach on level and trend assessments, it did not identify the significant subcategories. The outcomes of the analysis show that almost all agriculture categories (except for N_2O emissions from manure management and CH_4 and N_2O emissions from field burning of agricultural residues) are key categories. Despite this fact, Portugal does not use a tier 2 methodology for all significant subcategories for key categories according to the IPCC good practice guidelines. The ERT recommends that Portugal follow the IPCC good practice guidance for: the prioritization of key categories and identification of significant subcategories; the implementation of planned improvements; and the appropriate use of QA/QC procedures (e.g. identification of key subcategories (i.e. animal types) for key categories).

52. The ERT welcomes the effort of Portugal to use country-specific parameters and EFs for some categories and to provide sectoral background tables with time-series information (e.g. detailed information on animal subcategories according to species). However, the ERT considers that the information on methodologies and choice of EFs and country-specific parameters is not sufficiently transparent and recommends that Portugal increase the transparency of the text of the NIR agriculture chapter by providing more comprehensive information and cross-references to the annexes or to other relevant background documents. The ERT noted that the agriculture chapter in the NIR is rather extensive and the ERT believes that although some parts may be deleted (e.g. sections that repeat the equations from the Revised 1996 IPCC guidelines or the IPCC good practice guidance) others could be expanded to include, for example, more discussion on country-specific circumstances. The ERT also reiterates the recommendation from the previous review report that the Party use the correct references to the IPCC documents in order to avoid confusion and misunderstanding.

53. The ERT noted that Portugal calculated uncertainties in the agriculture sector using a tier 1 approach with IPCC default values for the uncertainties associated with the AD and EFs. However, the results of the uncertainty assessment are not included in the agriculture chapter of the NIR. Several data sets (based on expert judgement, but without a scientific rationalization) are provided after each subcategory description in the NIR. The ERT is of the view that this information does not have any practical influence on the overall uncertainty assessment. Therefore, the ERT reiterated the recommendation from the previous review report that the Party develop a country-specific uncertainty assessment and provide justification and scientific rationale for the parameters used for key categories of the agriculture sector.

54. The ERT noted that Portugal included some examples of its QA/QC system in the agriculture chapter of the NIR (e.g. a quality assessment for animal numbers, comparison with FAOSTAT (the database of the Food and Agriculture Organization of the United Nations (FAO)). The ERT welcomes this information, but noted that the QA/QC plan does not provide enough information and some errors were detected in the annual submission. The ERT recommends that Portugal improve its QA/QC procedures in order to reduce typographical errors in the NIR and inconsistencies between the CRF tables and the NIR and report more detailed information on its QA/QC procedures, including on the results of comparisons and discussions on the differences and time-series inconsistencies.

2. Key categories

Enteric fermentation – CH_4

55. The ERT noted that, according to the NIR, Portugal used a tier 2 methodology and country-specific EFs for all animal categories except for mules, asses and horses. However, as also noted in the previous review report, the methodology and EFs for dairy cattle are based on the milk production regression based on default IPCC values instead of the detailed feed intake and other characteristics of the dairy cattle (typical animal mass for dairy cows is reported as "NE"). The ERT reiterates the recommendation in the previous review report that Portugal implement correctly the tier 2 methodology for dairy cattle in line with the IPCC good practice guidance.

56. In response to the list of potential problems and further questions raised by the previous ERT during the review week, Portugal provided revised estimates through implementing a recommendation to change the lactation period for non-dairy cattle from 56 days/year to 188 days/year with the milk yield of 8.0 kg per day of the milking period. The ERT welcomes this improvement and recommends that Portugal include a more thorough explanation and the rationale for this change in its NIR.

57. The ERT noted that the animal numbers for dairy cattle for all years are not consistent with the FAOSTAT animal numbers; while the animal numbers used for the annual inventory for the 1990s are higher than given in FAOSTAT, the numbers used for the latest years are lower. The NIR provides information on a quality assessment of the livestock numbers, but only for the period 1990–2004. In response to a question raised by the ERT, Portugal explained that the reason for the inconsistencies between the CRF tables and FAO population data is the fact that the FAO data originate from the statistical information published by Eurostat. While INE has revised the livestock time series and has communicated the new data to Eurostat, Eurostat has still to transmit these revised data to FAO. The ERT recommends that the Party include an explanation of these differences in the NIR.

58. The ERT noted that the use of notation keys is not always in line with the IPCC good practice guidance. For example, the notation key "NE" is used for: animal weight and digestibility of feed for dairy cattle; work hours for horses, mules and asses; average methane conversion rate, average gross energy intake, digestibility and animal weight for poultry. The ERT recommends that the Party use the notation key "NA" (not applicable) instead.

Manure management – CH_4

59. The ERT noted that Portugal uses a tier 2 method from the IPCC good practice guidance and country-specific data to estimate CH_4 emissions from manure management. However, the country-specific EFs derived by the Party are not provided in the NIR and there is no information on whether they have been compared with the IPCC default EFs. The ERT reiterates the recommendation in the previous review report that Portugal include

a time series of the country-specific EFs for animal categories and compare them with the IPCC default EFs.

60. For animal waste management systems, the ERT noted some discrepancies in the trend of the allocation for several animal types (dairy and non-dairy cattle, goats, poultry and sheep). Specifically, for anaerobic lagoons for dairy cattle, sheep and goats, and liquid systems for non-dairy cattle and poultry for 1990 the notation key "NO" was used, while for the remaining years actual values were reported. The same situation was noted for methane conversion factor values. The ERT also noted that while the notation key "IE" is used for all animal categories for dry lot, the information where the emissions are included is missing. Also, the ERT is of the view that for buffaloes the notation key should be "NO" and not "IE" as used in the CRF tables. In response to a question raised by the ERT, Portugal explained that due to the lack of direct data the use of the notation keys was based on expert judgement (taking into account survey data and field knowledge). The ERT recommends that Portugal revise the time series for the allocation of animals in animal waste management systems and revise the use of notation keys according to the IPCC good practice guidance.

61. The ERT noted that, during 1990–2011, the CH_4 IEF decreased by 4.5 per cent between 1990 and 2011. In response to a question raised by the ERT, Portugal explained that the differences in the trend of the decreases were due to differences in the average carcass weight/head at slaughter for the years 1993, 1997 and 2011. The ERT recommends that Portugal improve the transparency of the time series by providing a detailed description of the trends in the NIR.

Rice cultivation – CH_4

62. The ERT noted different trends in the CH_4 IEF time series: for the years 1990–2001 the IEF value was constant at 31.93 g/m^2, while for the years 2002–2011, the IEF increased continually reaching a value of 69.13 g/m^2 in 2011. The 2011 value was the highest among reporting Parties (2011 range: 12.00–69.13 g/m^2) and higher than the IPCC default EF for this category. The ERT believes that this could be an area of potential overestimation of emissions and encourages Portugal to investigate this issue further and provide an explanation of the trends in its NIR.

Agricultural soils – N_2O

63. Recommendations made in previous review reports that Portugal make more efforts to improve its reporting on synthetic fertilizers[3] have not been implemented, and Portugal has not reported national values for consumption of synthetic fertilizers in 2011. The ERT reiterates the recommendation in the previous review report that Portugal improve data collection on synthetic fertilizer consumption in order to improve the transparency of its reporting.

3. Non-key categories

Manure management – N_2O

64. The ERT noted an inconsistency in the reporting of total nitrogen excreted by animals provided in table 6.32 of the NIR and the total nitrogen excreted by animals provided in the CRF table 4.B(b), namely in the totals reported in the NIR table (153,185 ton N/yr) and CRF table (153,707635.4 kg N/yr) for 2011. This is a basic quality control (QC) check according to the IPCC good practice guidance. The ERT is of the view that this can be an indication that the QA/QC system is not fully implemented by the Party.

[3] Document FCCC/ARR/2012/PRT, paragraph 125.

The ERT recommends that Portugal increase its efforts, enhancing the QC system and avoiding these errors.

E. Land use, land-use change and forestry

1. Sector overview

65. In 2011, net removals from the LULUCF sector amounted to 5,319.75 Gg CO_2 eq. Since 1990, the sector has changed from a net source (8,496.18 Gg CO_2 eq) to a net sink. The key driver for the rise in removals is the increased in removals from forest land remaining forest land. Within the sector, net removals of 7,604.1 Gg CO_2 eq were from forest land, followed by 4,296.3 Gg CO_2 eq from other land and 441.4 Gg CO_2 eq from other (harvested wood products), while net emissions of 3,745.5 Gg CO_2 eq were from cropland, followed by 1,792.1 Gg CO_2 eq from settlements, 1,081.7 Gg CO_2 eq from grassland and 402.8 Gg CO_2 eq from wetlands.

66. The land area of the Portuguese territory (including Azores and Madeira) has been classified according to the six land-use categories from the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). Each category has then been divided into "X land remaining X land" and "land converted to X land". Following the IPCC approach 2, the Party has implemented time period estimates for land areas for 1995, 2005 and 2010, based mainly on the sixth national forest inventory (NFI) detailed sampling of orthophotographs and classified imagery. A complete time series of land-use matrices for the period 1970–2011 was subsequently developed using extrapolation and interpolation techniques based on supplementary information from sources including the General Census of Agriculture (1979, 1989, 1999, 2009) and previous NFIs. The ERT commends Portugal for updating the land-use information products used for developing emissions/removals estimates.

67. The major improvements to the inventory for the LULUCF sector since the previous annual submission include:

(a) The CORINE Land Cover database has been replaced by the sixth NFI as the information source for land use and land-use change information for mainland Portugal;

(b) Data and coefficients for the biomass expansion factor (BEF), root-to-shoot factors and average standing biomass for all land uses were corrected and implemented in a systematic manner (see paras. 71 and 73 below);

(c) Estimates for above- and below-ground biomass for conversions between cropland and grasslands are now included in estimates;

(d) Carbon contents of broadleaf and conifer trees along with litter and other pools were adjusted to be consistent with default values of the 2006 IPCC Guidelines;

(e) The activities of no-tillage in cropland and biodiverse pastures in grassland are now reported under both the Convention and its Kyoto Protocol;

(f) General improvements due to corrections have been made through QA/QC processes.

68. The ERT noted that Portugal assumes that CO_2 emissions from fire events include the carbon in the whole tree and that there is no resulting transfer to the dead organic matter pools when these events occur. The ERT recommends that Portugal improve the accuracy of its reporting for this pool or provide justification for the approach used in the next NIR.

69. The ERT noted that some references in the NIR which were identified in the previous review report as incorrect, such as the incorrect use of default BEF values for carbon stock changes, were not corrected and recommends that the Party review the appropriate QC procedures to ensure that all studies and other background materials are correctly referenced.

70. The ERT noted that Portugal uses a variety of earth observation and sampling approaches to develop estimates for land-use activity. However, the NIR does not provide sufficient information on the approach used to determine quantitative uncertainty estimates for LULUCF AD. The ERT recommends that the Party provide such information in the NIR in order to improve transparency.

2. Key categories

Forest land remaining forest land – CO_2

71. In response to a recommendation made in the previous review report, Portugal has recalculated the net removals to correct for a potential overestimation in the carbon stock changes in forest land remaining forest land. Default BEF and root-to-shoot ratios have been corrected and information on the source of these values has been provided in the NIR. The ERT commends the Party for this improvement.

72. The ERT noted that the approach used for forest fires (see para. 68 above) reduces residual emissions associated with living biomass conversion to dead organic matter. In this regard, the ERT recommends that Portugal provide further clarification and justification regarding the assumption that all living biomass is oxidized during fire events.

Land converted to forest land – CO_2

73. In 2011, net CO_2 removals from land converted to forest land amounted to 6,202.27 Gg CO_2. This sink represents 80.5 per cent of the total net CO_2 removals from forest land (7,707.15 Gg CO_2). In response to recommendations made in the previous review report, the Party has corrected the default BEF and root-to-shoot ratios in this annual submission. The Party has improved the transparency of the information by providing the source of these factors and the rationale for their selection. The ERT commends the Party for these improvements.

F. Waste

1. Sector overview

74. In 2011, emissions from the waste sector amounted to 8,280.43 Gg CO_2 eq, or 11.8 per cent of total GHG emissions. Since 1990, emissions have increased by 38.1 per cent. The key driver for the rise in emissions is the increase in emissions from managed waste disposal sites by 68.9 per cent from 1990 to 2011, mainly due to the increase in the amount of solid waste deposited in municipal solid waste disposal sites. Within the sector, 61.9 per cent of the emissions were from solid waste disposal on land, followed by 37.9 per cent from wastewater handling and 0.3 per cent from waste incineration. A remaining contribution of less than 0.1 per cent was from biogas flaring.

75. The ERT noted that some of the recommendations in the previous review report have been implemented, especially those related to the inclusion of estimates of the amount of CH_4 recovered in solid waste disposal sites and use of the country-specific protein consumption rate. However, some other recommendations made in the previous review report that could improve the transparency of the inventory are still pending and are reiterated in the category-specific paragraphs below.

76. With regard to transparency, the methods and data used to calculate the emission estimates are generally explained in the NIR. Portugal has reported on the implemented sector-specific QA/QC activities, which include cross-checking with the default values and the comparison of the annual submission with the other countries. Nevertheless, there are some typing mistakes that resulted in reporting different data in the CRF tables and the NIR. The ERT recommends Portugal apply verification and QA/QC procedures more strictly and conduct category-specific QA/QC procedures for all waste categories.

2. Key categories

Solid waste disposal on land – CH_4

77. The first-order decay method (tier 2) was applied to estimate CH_4 emissions from urban and industrial solid waste disposal on land, in line with the IPCC good practice guidance. The parameters used for the estimation of emissions are mainly IPCC default values, except for degradable organic carbon (DOC), which is derived from country-specific data on waste composition. For the period 1960–1998, the waste disposal data have been extrapolated backwards on the basis of the per capita waste generation rate, the population figures and the proportion of the population connected to a waste collection system. The Party has used a country-specific decay rate constant value of 0.07 throughout the time series, which is in an acceptable range in comparison with other countries

78. The ERT noted that the urban waste composition has been recalculated for 2001–2009 and revised for 2010, which leads to a decrease of CH_4 emissions for the period 2001–2010 of 4 per cent on average. In response to a question raised by the ERT, the Party explained that, regarding the period 2001–2009, the recalculations refer to the recalculation of DOC values based on interpolation of the DOC values for the years 2000 and 2010, which previously were kept constant and equal to 2000 data. For 2010, there were revisions in the composition of the waste. The ERT recommends that Portugal expand the documentation on the recalculations in its NIR in order to enhance transparency.

79. The ERT noted that for the period prior to 1999, the amount of municipal waste is based on expert judgement on the per capita waste generation rate. In response to a question raised by the ERT on the justification for this assumption, Portugal explained that the assumption was based on scaled information for municipal solid waste production in mainland Portugal, which indicated a trend of 3 per cent in the period (1980–1985) that increased after the accession to the EU in 1986. A smaller rate (2.5 per cent) was indicated for previous years (1960–1979). The ERT recommends that Portugal improve the documentation of the assumptions made for country-specific data in its NIR in order to enhance transparency.

Wastewater handling – CH_4 and N_2O

80. The ERT noted that Portugal used the method from the Revised 1996 IPCC Guidelines for the estimation of emissions from domestic wastewater handling. Portugal has generally provided a clear description of the approach taken to estimate emissions from domestic wastewater handling, including detailed information on the proportions of the population connected to each wastewater handling system and the assumptions associated with each of these systems. The ERT noted that Portugal provided in the NIR population data to determine the population served by waste collection systems and domestic wastewater handling. In response to questions raised by the ERT, Portugal confirmed that the different figures were due to a technical problem. The ERT recommends that Portugal ensure consistency by using the same population data in all inventory categories and that the Party also ensure that QC procedures are enhanced in order to avoid the occurrence of such errors.

81. Portugal has estimated the quantity of CH_4 to be deducted from the domestic wastewater handling emissions using biogas data from the Portuguese Department of Energy. An assumed fraction of CH_4 in biogas of 60 per cent is used to derive an estimate of CH_4 from the quantities of biogas. In response to a question raised by the ERT, Portugal explained that the figure is based on the assumption that municipal wastewater treatment uses anaerobic digestion where biogas produced has a CH_4 content of 60–70 per cent. The ERT reiterates the recommendation from the previous review report that Portugal include this information in its NIR in order to improve the transparency of the CH_4 emission estimates and trend.

82. The ERT noted that Portugal used the IPCC default methodology from the Revised 1996 IPCC Guidelines for the estimation of N_2O emissions from human sewage. The N_2O emissions associated with the sludge spreading on land after generation from wastewater treatment are not estimated separately. However, these emissions are included as part of the total estimate of N_2O emissions from wastewater handling. The NIR states that there is no reliable information to enable a separate calculation for sewage sludge spreading. In response to a question raised by the ERT, Portugal explained that data on the agriculture use of sludge has started to be collected by the Regional Directorates for Agriculture and Fisheries (DRAPs) for recent years, under the EU directive 86/278/EEC, and will be reported annually in future submissions. The ERT encourages Portugal to obtain the necessary information in order to calculate the emissions. In addition, the ERT reiterates the recommendation from the previous review report that Portugal reallocate emissions from sewage sludge spreading on agricultural land to the agriculture sector.

83. Emissions from industrial wastewater handling were estimated using the relevant methodology from the Revised 1996 IPCC Guidelines. The ERT noted that the assumptions used for the values of wastewater and chemical oxygen demand generation by industry are provided in the NIR together with information on the methods and AD used for the emission estimates. Furthermore, Portugal has indicated in its NIR that new information has been collected from environmental licensing (under the EU's Integrated Pollution Prevention and Control (IPPC) directive) in order to improve the characterization of the industrial wastewater treatment systems. The ERT recommends that Portugal use this new information to ensure the time-series consistency of existing data with other reliable data source.

3. Non-key categories

Waste incineration – CO_2, CH_4 and N_2O

84. Municipal waste incineration in Portugal is carried out with energy recovery and is therefore reported under the energy sector. Only emissions from the incineration of clinical and industrial waste that occur without energy recovery are reported under the waste incineration category. The ERT noted that the description of the incinerated amount of municipal waste is provided in the waste chapter of the NIR without transparent information of the data source. The ERT reiterates the recommendation from the previous review report that Portugal provide the information on the source of AD used for each waste stream in order to improve the transparency in its next submission.

85. As noted in the previous review report, there are some structural breaks in the time series of the AD for industrial solid waste incineration. INE has corrected the industrial solid waste incineration data for 2004 onwards to account for missing information from respondents. However, this correction has not been applied to the data for the earlier years of the time series. The ERT reiterates the recommendation from the previous review report that Portugal make efforts to ensure the time-series consistency of AD for waste incineration.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

86. Table 6 provides an overview of the information reported and parameters selected by Party under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

	Findings and recommendation
Has the Party reported information in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1?	Sufficient
Identify any elected activities under Article 3, paragraph 4, of the Kyoto Protocol	Activities elected: forest management, cropland management, and grazing land management Years reported: 1990, 2008, 2009, 2010, 2011
Identify the period of accounting	Commitment period accounting
Assessment of the Party's ability to identify areas of land and areas of land-use change	Sufficient

87. The methods, AD and EFs used for the calculation of the emission/removal estimates for afforestation and reforestation, deforestation and forest management activities are the same as those used for the reporting under the Convention (see para. 66 above). The ERT commends Portugal for updating the land-use information products used for developing emissions/removals estimates while also noting several reiterated recommendations for improvements.

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

88. The ERT noted that the Party has made improvements in response to the recommendations in the previous review report. However, it is still of the view that the removals from afforestation and reforestation activities and the emissions from deforestation activities under Article 3, paragraph 3, of the Kyoto Protocol may have problems in in their accuracy, owing to the omission of dead wood in forest land for post-fire event land conversion. The ERT reiterates the recommendation from the previous review report that Portugal improve the accuracy of its reporting by addressing these issues.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Cropland management – CO_2

89. The ERT noted that the Party has provided a description of the methods and EFs applied to the practice of no-tillage in the NIR. The ERT commends Portugal for the improvement of the NIR by providing a description of the practice of no-tillage in cropland, in response to recommendations in the previous review report. However, the information is not complete as it does not provide all of the references used: the ERT recommends that the Party make further improvements in order to ensure that all reference materials are available (including specific dates for all census material used) and that descriptions are clear and correct. The ERT also recommends that Portugal provide greater detail in terms of the duration of no-tillage practices and, if appropriate, on any specific commitments by farmers.

Grazing land management – CO_2

90. The ERT noted that the Party has provided a description of the methods and EFs applied to the practice of no-tillage in the NIR. The ERT commends Portugal for the improvement of the NIR by providing a description of the practice of sowing of biodiverse pastures, in response to recommendations made in the previous review report. However, the information is incomplete as it does not provide all of the references used: the ERT recommends that the Party implement further improvements by demonstrating that this practice did not occur before 1990 and by ensuring that all references are correct. The ERT also recommends that Portugal provide greater detail in terms of the specific approach used in determining removals for the practice "sown biodiverse permanent pasture rich in legumes", ensuring that cited references are provided in the NIR.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

91. Portugal has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[4] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10. The ERT reiterated the main findings and recommendations contained in the SIAR. In response to questions raised during the review week, Portugal provided additional information on its response to the SIAR recommendations. The ERT considered that the responses from Portugal addressed the SIAR findings.

92. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j). The transactions of Kyoto Protocol units initiated by the national registry are in accordance with the requirements of the annex to decision 5/CMP.1 and the annex to decision 13/CMP.1. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

[4] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

93. Information reported by Portugal on records of any discrepancies and on any records of non-replacement was found to be consistent with information provided to the secretariat by the ITL. The SIAR identified that corrective actions were taken by Portugal, and the ERT concluded that the Party's records on its accounting of Kyoto Protocol units contained in its national registry are consistent with the corresponding records of the ITL. No discrepancy has been identified by the ITL and no non-replacement has occurred. The national registry has adequate procedures in place to minimize discrepancies.

Calculation of the commitment period reserve

94. Portugal has reported its commitment period reserve in its 2013 annual submission. Portugal reported that its commitment period reserve has not changed since the initial report review (343,743,774 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

95. Portugal reported that there are changes in its national system since the previous annual submission. The Party explained that the Ministries of Environment and of Agriculture were merged into a new Ministry of Agriculture, Sea, Environment and Land-Use Planning, and several institutions were integrated into the former APA, including the ex-National Water Institute and the five Hydrographic Regional Administrations. Furthermore, Portugal stated that the changes refer mostly to a rearrangement of pre-existing services within a new hierarchy and not a change of competences of the departments. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

96. Portugal reported that there are changes in its national registry since the previous annual submission. The Party described the changes, specifically due to the centralization of the EU ETS operations into a single European Union registry operated by the European Commission called the Consolidated System of European Union registries (CSEUR), in its NIR (see p. 607). The CSEUR is a consolidated platform, which implements the national registries in a consolidated manner and was developed together with the new EU registry.

97. The ERT noted that there were recommendations in the SIAR that had not been addressed, in particular recommendations related to fully reporting on the changes in the database structure and reporting of test results. In response to questions raised by the ERT during the review, Portugal provided further information on these issues.

98. The ERT concluded that, taking into account the confirmed changes in the national registry, including additional information provided to the ERT during the review, Portugal's national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP).

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

99. Portugal reported that there are no changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, since the previous annual submission. The ERT concluded that the information provided continues to be complete and transparent.

100. Portugal reported on key policies and measures, on the cooperation with developing countries in order to improve the integration of adaptation for sectoral policies and instruments of planning, vulnerabilities and risks associated with climate change.

III. Conclusions and recommendations

A. Conclusions

101. Table 7 summarizes the ERT's conclusions on the 2013 annual submission of Portugal, in accordance with the guidelines for review under Article 8 of the Kyoto Protocol.

Table 7
Expert review team's conclusions on the 2013 annual submission of Portugal

		Paragraph cross-references
The ERT concludes that the inventory submission of Portugal is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)		
Annex A sources[a]	Complete	Table 3
LULUCF[a]	Complete	Table 3
KP-LULUCF	Complete	Table 3
The ERT concludes that the inventory submission of Portugal has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes	22, 45
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes	
The Party's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	Generally yes	22, 43, 51, 55
Portugal has reported information on Article 3, paragraphs 3 and 4, of the Kyoto Protocol	Yes	
Portugal has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did Portugal provide information in the NIR on changes in its	Yes	

	Paragraph cross-references
reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories", IPCC = Intergovernmental Panel on Climate Change.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

B. Recommendations

102. The ERT identified the issues for improvement listed in table 8. All recommendations are for the next annual submission, unless otherwise specified.

Table 8
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
Cross-cutting	Overview	Improve the description of the recalculations in the NIR, by including more detailed descriptions of the changes that have occurred in the NIR	Table 3
	Quality assurance/ quality control	Increase the QA/QC and verification procedures for sectoral reporting, namely for the purpose of more consistent reporting in the NIR and in the CRF tables	Table 3
	Inventory planning	Include in the NIR information on the three-year schedule for QA/QC activities and its specific QA/QC coordinator to further clarify its capacities on elaborating a QA/QC plan in line with the specific functions in decision 15/CMP.1, paragraph 12(d)	9
		Update the NIR with the references used, and clearly document the justifications for country-specific methodological approaches	9
	Inventory preparation	Improve the reporting of the uncertainty analysis results in the NIR, including publishing quantitative results for the uncertainty in total GHG emissions, both level and trend	Table 4
	Inventory management	Improve the archiving system by providing further guidance on the record-keeping and archiving procedures	11
	Follow-up from previous review	Implement all recommendations from the previous review report as a matter of priority	12
Energy	Overview	Improve the transparency of the NIR by providing more	15

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		complete information on the methodologies used, including how the flaring feed density is taken into account in the calculation of emissions	
		Improve the QA/QC procedures to ensure consistency in reporting	16
	Reference and sectoral approaches	Report separately for each coal type: e.g. coke oven/gas coke, coking coal and sub-bituminous coal	18
		Reconcile differences between national fuel consumption data reported in the CRF tables and IEA statistics	19
		Correct the amount of natural gas imports for 2003 in CRF table 1.A(d) and in the NIR	20
	Feedstocks and non-energy use of fuels	Estimate the non-energy use of their fuels in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance), ensuring that there is no double counting or underestimation of emissions and explain in the NIR how these emissions are treated	22
		Report on the cessation of ammonia production in the energy sector	23
		Use the notation keys correctly in CRF table 1.A(d)	25
	Stationary combustion: all fuels – CO_2, CH_4, N_2O	Report CO_2 emissions from limestone used for desulphurization in the industrial processes sector	26
		Explain in the NIR the 46.9 per cent decrease in the CH_4 IEF (1990–2011)	27
		Include explanations for the increase in CH_4 IEF from the consumption of gaseous fuels in energy industries between 1997 and 2011	29
		Reconcile the data sets for AD (energy balance and data from facilities) for iron and steel production in relation to the consumption of tar and oil waste	30
		Update CO_2 EFs for gasoline reported in the NIR	31
	Fugitive emissions from oil and natural gas: all – CO_2, CH_4	Disaggregate flaring and venting emissions and explain how it is done in the NIR	35

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		Provide information on hydrogen production and fluid catalytic conversion in the NIR	36
Industrial processes and solvent and other product use	Overview	Improve transparency of the NIR by providing a more detailed description of the improvements made, such as for lime production and glass production	38
		Update the QA/QC plan for the industrial processes sector to enhance the consistency of the information provided	39
	Cement production – CO_2	Provide detailed description of the methodology used and describe how time-series consistency is ensured	40
	Lime production – CO_2	Provide the results of the AD check to improve the accuracy and transparency of emission estimates	41
	Consumption of halocarbons and SF_6 – HFCs	Increase the transparency of the reporting by providing information on the comparison of the results of the two models used and how the use of the 2006 IPCC Guidelines is consistent with the IPCC good practice guidance and the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories"	43
	Glass production – CO_2	Include additional explanations on the methodology provided during the reviews in its NIR	44
	Consumption of halocarbons and SF_6 – SF_6	Provide in its NIR more complete information on the methodology used to estimate emissions as an insulation gas in substations and as current interruption media	46
	Solvent and other product use – CO_2	Provide clear explanations of the data and methodology used in its NIR	47
Agriculture	Overview	Include more comprehensive information on the reasons for the recalculations, the impact on GHG emissions and a comparison of previous and actual estimations according to the categories and sources	49
		Follow the IPCC good practice guidance for: the prioritization of key categories and identification of significant subcategories; the implementation of planned improvements; and the appropriate use of QA/QC procedures	51
		Increase the transparency in the text of the NIR by providing more comprehensive information, cross-references to the annexes or to other relevant background documents	52
		Use the correct references to IPCC documents to avoid confusion and misunderstanding	

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		Develop a country-specific uncertainty assessment and provide justification and scientific rationale for the parameters used for key categories	53
		Improve QA/QC procedures in order to reduce typing errors in the NIR and inconsistencies between the CRF tables and the NIR and report more detailed information on QA/QC procedures, including on the results of comparisons and discussions on the differences and time-series inconsistencies	54
	Enteric fermentation – CH_4	Implement correctly the tier 2 methodology for the estimation of emissions from dairy cattle in line with the IPCC good practice guidance	55
		Include in the NIR more explanation and the rationale for the change in the lactation period for non-dairy cattle in the NIR	56
		Include an explanation of the differences between data in the CRF tables and FAO data for dairy cattle	57
		Use the notation key "NA" for: animal weight and digestibility of feed for dairy cattle; work hours for horses, mules and asses; average methane conversion rate, average gross energy intake, digestibility and animal weight for poultry	58
	Manure management – CH_4	Include a time series of the country-specific EFs for animal categories and compare it with the IPCC default EFs	59
		Revise the time series for the allocation of animals in animal waste management systems and revise the use of notation keys according to the IPCC good practice guidance	60
		Improve the transparency of the time-series by providing a detailed description of the trends in IEF and emissions from sheep in the NIR	61
	Rice cultivation – CH_4	Investigate the methodology used for the estimation of emissions and provide an explanation of the trends of IEFs in the NIR	62
	Agricultural soils – N_2O	Improve data collection on synthetic fertilizer consumption and improve data collection in order to improve the transparency of the reporting	63
	Manure management – N_2O	Enhance the QC system to avoid detected errors	64
LULUCF	Overview	Collect data on living biomass and dead wood and provide estimates for fire events from these pools	68

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
		Review the references related to LULUCF and implement appropriate QC procedures to ensure that all studies and other background materials are correctly referenced	69
		Provide information on the approaches used to determine quantitative uncertainty estimates for LULUCF AD	70
	Forest land remaining forest land – CO_2	Provide further clarification and justification to support the assumption that all living biomass is oxidized during fire events	72
Waste	Overview	Apply verification and QA/QC procedures more strictly and conduct category-specific QA/QC procedures for all waste categories	76
	Solid waste disposal on land– CH_4	Expand the documentation on the recalculations in order to enhance transparency	78
		Improve the documentation of the assumptions made for country-specific data on the amount of municipal waste in order to enhance transparency	79
	Wastewater handling – CH_4 and N_2O	Ensure the consistency of the reporting by using the same population data in all inventory categories and ensure that QC procedures are enhanced to avoid the occurrence of errors	80
		Enhance the transparency of its biogas data reporting by providing this information in its NIR	81
		Obtain the necessary information in order to calculate the emissions and reallocate emissions from sewage sludge spreading on agricultural land to the agriculture sector	82
		Implement the planned improvement, to ensure the time-series consistency of the existing data on industrial wastewater handling	83
	Waste incineration – CO_2, CH_4 and N_2O	Provide the information on the source of AD used for each waste stream in order to improve the transparency of its reporting	84
		Ensure the time-series consistency of AD for waste incineration	85
KP-LULUCF	Afforestation and reforestation – CO_2	Improve the accuracy of reporting by addressing issues relating to the assumption that carbon stock in living biomass and deadwood in wetlands and settlements is zero; and to the omission of dead wood in forest land for post-fire event land conversion	88
	Cropland	Revise and expand the description of the methods and EFs	89

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
	management – CO_2	applied to the practice of no-tillage and include relevant references in the NIR	
	Grazing land management – CO_2	Improve the transparency by providing references and details for the practice "sown biodiverse permanent pasture rich in legumes" in the NIR	90

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, FAO = Food and Agriculture Organization of the United Nations, IEA = International Energy Agency, IEF = implied emission factor, IPCC = Intergovernmental Panel on Climate Change, GHG = greenhouse gas, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable, NIR = national inventory report, QA/QC = quality assurance/quality control, QC = quality control.

IV. Questions of implementation

103. No questions of implementation were identified by the ERT during the review.

Annex I

Background data on recalculations and information to be included in the compilation and accounting database

Table 9
Recalculations in the 2013 annual submission for the base year and the most recent year

	1990	*2010*	*1990*	*2010*	
Greenhouse gas source and sink categories	*Value of recalculation (Gg CO_2 eq)*		*Per cent change*		*Reason for the recalculation*
1. Energy	**637.63**	**–334.37**	**1.6**	**–0.7**	Improved AD, EF
A. Fuel combustion (sectoral approach)	583.38	–369.38	1.4	–0.8	
1. Energy industries	0.13	–74.31	0.0	–0.5	
2. Manufacturing industries and construction	583.25	–231.93	6.3	–2.4	
3. Transport		–6.55		–0.0	
4. Other sectors		–56.59		–1.1	
5. Other					
B. Fugitive emissions from fuels	54.25	35.01	16.25	2.2	
1. Solid fuels					
2. Oil and natural gas	54.25	35.01	21.4	2.2	
2. Industrial processes	**169.78**	**7.20**	**3.6**	**0.1**	Improved AD, EF and methodological changes
A. Mineral products	10.48	–67.66	0.3	–1.7	
B. Chemical industry		0.20		0.0	
C. Metal production	159.30	56.44	1 000.1	318.8	
D. Other production					
E. Production of halocarbons and SF_6					
F. Consumption of halocarbons and SF_6		18.22		1.2	
G. Other					
3. Solvent and other product use	**–2.26**	**–2.25**	**–0.7**	**–1.0**	
4. Agriculture		**–78.62**		**–1.0**	Improved AD and methodological changes
A. Enteric fermentation		–10.33		–0.4	
B. Manure management		–10.11		–0.7	
C. Rice cultivation		–4.52		–1.2	
D. Agricultural soils		–54.04		–1.8	
E. Prescribed burning of savannas					

Greenhouse gas source and sink categories	1990	2010	1990	2010	Reason for the recalculation
	Value of recalculation (Gg CO_2 eq)		Per cent change		
F. Field burning of agricultural residues		0.38		1.1	
G. Other					
5. Land use, land-use change and forestry	**15 383.38**	**6 394.83**	**–223.4%**	**–64.7**	Improved AD and methodological changes
A. Forest land	6 132.48	5 110.76	–94.3%	–46.7	
B. Cropland	5 604.28	3 398.97	752.9%	1 461.0	
C. Grassland	3 719.10	1 705.71	3 892.1%	–313.3	
D. Wetlands	–386.90	–97.10	–99.8%	–19.9	
E. Settlements	–1 062.25	–329.11	–97.1%	–16.0	
F. Other land	1 376.68	–3 394.39	–171.6%	493.2	
G. Other					
6. Waste	**6.57**	**–183.71**	**0.1**	**–2.3**	Improved AD, EF
A. Solid waste disposal on land		–231.14		–4.4	
B. Wastewater handling	4.15	31.13	0.1	1.1	
C. Waste incineration	2.42	16.29	21.5	108.5	
D. Other		0.01		11.6	
7. Other					
Total CO_2 equivalent without LULUCF	**811.40**	**–591.75**	**1.3**	**–0.8**	
Total CO_2 equivalent with LULUCF	**16 194.78**	**5 803.08**	**30.4**	**9.3**	

Abbreviations: AD = activity data, EF = emission factor, LULUCF = land use, land-use change and forestry.

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2011, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	343 743 774			343 743 774
Annex A emissions for 2011				
CO_2	51 526 537			51 526 537
CH_4	12 446 610			12 446 610
N_2O	4 478 921			4 478 921
HFCs	1 491 489			1 491 489
PFCs	0			0
SF_6	42 890			42 890
Total Annex A sources	**69 986 446**			**69 986 446**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	–8 806 284			–8 806 284
3.3 Afforestation and reforestation on harvested land for 2011	1 703 940			1 703 940
3.3 Deforestation for 2011	6 194 301			6 194 301
Activities under Article 3, paragraph 4, for 2011[c]				
3.4 Forest management for 2011	–647 803			–647 803
3.4 Cropland management for 2011	908 830			908 830
3.4 Cropland management for the base year	5 257 938			5 257 938
3.4 Grazing land management for 2011	–664 669			–664 669
3.4 Grazing land management for the base year	2 034 966			2 034 966
3.4 Revegetation for 2011	NA			NA
3.4 Revegetation in the base year	NA			NA

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve				
Annex A emissions for 2010				
CO_2	52 640 559			52 640 559
CH_4	12 484 311			12 484 311
N_2O	4 698 948			4 698 948
HFCs	1 515 030			1 515 030
PFCs	0			0
SF_6	43 567			43 567
Total Annex A sources	**71 382 416**			**71 382.416**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	–8 566 142			–8 566 142
3.3 Afforestation and reforestation on harvested land for 2010	1 809 836			1 809 836
3.3 Deforestation for 2010	6 516 749			6 516 749
Activities under Article 3, paragraph 4, for 2010[c]				
3.4 Forest management for 2010	780 298			780 298
3.4 Cropland management for 2010	1 157 725			1 157 725
3.4 Cropland management for the base year	5 257 938			5 257 938
3.4 Grazing land management for 2010	–470 725			–470 725
3.4 Grazing land management for the base year	2 034 966			2 034 966
3.4 Revegetation for 2010	NA			NA
3.4 Revegetation in the base year	NA			NA

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	57 049 848			57 049 848
CH_4	12 027 539			12 027 539
N_2O	4 718 551			4 718 551
HFCs	1 378 865			1 378 865
PFCs	3			3
SF_6	40 893			40 893
Total Annex A sources	**75 215 700**			**75 215.700**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	–8 870 514			–8 870 514
3.3 Afforestation and reforestation on harvested land for 2009	1 915 845			1 915 845
3.3 Deforestation for 2009	6 290 933			6 290 933
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009	–1 892 742			–1 892 742
3.4 Cropland management for 2009	1 340 582			1 340 582
3.4 Cropland management for the base year	5 257 938			5 257 938
3.4 Grazing land management for 2009	–344 423			–344 423
3.4 Grazing land management for the base year	2 034 966			2 034 966
3.4 Revegetation for 2009	NA			NA
3.4 Revegetation in the base year	NA			NA

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	59 984 438			59 984 438
CH_4	12 189 528			12 189 528
N_2O	5 023 483			5 023 483
HFCs	1 248 561			1 248 561
PFCs	45			45
SF_6	35 631			35 631
Total Annex A sources	**78 481 686**			**78 481 686**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	–8 787 189			–8 787 189
3.3 Afforestation and reforestation on harvested land for 2008	2 021 967			2 021 967
3.3 Deforestation for 2008	5 724 341			5 724 341
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008	–1 937 162			–1 937 162
3.4 Cropland management for 2008	1 510 444			1 510 444
3.4 Cropland management for the base year	5 257 938			5 257 938
3.4 Grazing land management for 2008	–226 058			–226 058
3.4 Grazing land management for the base year	2 034 966			2 034 966
3.4 Revegetation for 2008	NA			NA
3.4 Revegetation in the base year	NA			NA

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

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FCCC/ARR/2012/PRT. Report of the individual review of the annual submission of Portugal submitted in 2012. Available at <http://unfccc.int/resource/docs/2013/arr/prt.pdf>.

Standard independent assessment report, parts 1 and 2. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Reference documents

Responses to questions during the review were received from Ms. Teresa Costa Pereira (Portuguese Environmental Agency), including additional material on the methodologies and assumptions used.

Annex III

Acronyms and abbreviations

AD	activity data
APA	Portuguese Environmental Agency
BEF	biomass expansion factor
C	carbon
CH_4	methane
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CORINAIR	Co-ordinated Information on the Environment in the European Community
CRF	common reporting format
CSEUR	Consolidated System of European Union registries
DOC	degradable organic carbon
EF	emission factor
EMEP	European Monitoring and Evaluation Programme
ERT	expert review team
EU	European Union
EU ETS	European Union Emissions trading system
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	database of the Food and Agriculture Organization of the United Nations
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
GJ	gigajoule (1 GJ = 10^9 joule)
HFCs	hydrofluorocarbons
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
INE	Portuguese Statistical Office
kg	kilogram (1 kg = 1,000 grams)
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
m^2	square metre
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NFI	national forest inventory
NIR	national inventory report
NO	not occurring
PFCs	perfluorocarbons
PJ	petajoule (1 PJ = 10^{15} joule)
QA/QC	quality assurance/quality control
QC	quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report

TJ	terajoule (1 TJ = 10^{12} joule)
UNFCCC	United Nations Framework Convention on Climate Change